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EFFICACY OF SOME INSECTICIDES FOR CONTROL OF THE HORN FLY

EFICÁCIA DE ALGUNS INSETICIDAS NO CONTROLE DA MOSCA-DOS-CHIFRES

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SUMMARY

The efficacy of pour-on formulations of alpha-cypermethrin, and spray formulations of either alpha-cypermethrin alone or cypermethrin combined with chlorfenvinphos, as well of chlorfenvinphos alone, was evaluated for the control of horn flies on grazing beef cattle. Fly population was monitored throughout 42 days post-treatment. The trial indicated that all used treatments provided at least a 90% reduction of horn flies over six week study and, at present, should be considered as useful weapons for the control of **Haematobia irritans** in Brazil.

UNITERMS: ***Haematobia irritans***; Insecticides; Cattle

INTRODUCTION

Flies can significantly hamper cattle performance, either by feeding upon such animals or just annoying them. In addition, blood-sucking flies cause reductions in weight gains and milk production in cattle; these reductions are results of poor feed utilization and blood loss[2,4,6].

The horn fly, ***Haematobia irritans*** (Linnaeus, 1758) is an obligate ectoparasite of cattle[9] which also feed on other animals such as sheep and horses[5,7]. Adults are a great nuisance to cattle on whose blood they feed, and they only leave their hosts briefly to oviposit or to sip moisture from fresh cowpats[13]. The most obvious symptoms of heavy horn fly infestations are restlessness and defensive behaviour in animals seeking to dislodge the flies. Such animals suffer continual interruption to their grazing and resting activities.

This economically important insect was introduced into North America on cattle imported from Europe between 1884 and 1886[3]. In Brazil, the fly was first reported in Boa Vista, Roraima, possibly introduced from Venezuela[14]. Despite efforts to retard the movement of the horn fly into uninfested areas within Brazil, the pest has become firmly established over much of the country. Thus, ***Haematobia irritans*** entered the State of São Paulo in 1990, where it is still establishing its range and in certain areas is just beginning to be found[10].

The continual association of horn flies with their bovine host makes them constantly accessible to animal insecticide treatments, that have historically been the control method of choice for the horn fly. Currently, spray and pour-on applications of insecticides are widely used on cattle for control of horn flies and other pests, providing a control approach that uses discreet, timed treatments for any particular year. Otherwise, at the present time, the chemical industry is rapidly implementing the concept of insecticide mixtures as a means to delay or prevent insecticide resistance[1,11].

We report here an evaluation of pour-on formulations of alpha-cypermethrin and spray formulations of either alpha-cypermethrin or cypermethrin combined with chlorfenvinphos, as well as chlorfenvinphos alone, for the control of horn flies on grazing beef cattle.

MATERIAL AND METHOD

The trial was initiated on November, 1991, and was conducted for six consecutive weeks on a farm at São José do Rio Preto County, SP. Eight separately pastured herds of mature Nelore cows were used. Animals weighed about 420 kg and were kept at the same 600-ha farm but in different paddocks and separated by double fencing. The distance between each paddock was about 700 m to 1.5 km while the trial was in progress.

The animals were decreasingly ranked on the basis of the mean values of three pre-treatment fly counts performed on days -2, -1 and 0. Each of the eight highest mean fly counts values were randomly allocated to one of eight treatment groups (G). The process was repeated using animals of lower mean fly counts values until all cows had been assigned to the following treatment groups on Day 0: G1- 2.0% alpha-cypermethrin, pour-on, 10 ml per animal; G2- 1.5% alpha-

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cypermethrin, pour-on, 10 ml per animal; G3- 1.0% alpha-cypermethrin, pour-on, 10 ml per animal; G4- 2.5% cypermethrin + 13.8% chlorfenvinphos, by hand spray, at the 1:1,000 dilution; G5- 2.5% cypermethrin + 13.8% chlorfenvinphos, by hand spray, at the 1:400 dilution; G6- 3.0% alpha-cypermethrin + 30% chlorfenvinphos, by hand spray, at the 1:1,000 dilution; G7- 40% chlorfenvinphos, by hand spray, at the 1:800 dilution; G8- untreated control. The choice of an untreated control group in this trial was, of necessity, a compromise in being far enough from the treated groups not to be influenced by them and close enough to have a comparable fly challenge.

The experimental drug formulations were supplied by the manufacturer*, witch also provided personnel for assistance in the administration of the treatments.

Treatments of groups 1, 2 and 3 was poured on along the midline of the backs of the animals. That of groups 4, 5, 6, and 7 was applied at a nominal rate of 4 litres per animal sprayed over the head, body, unsersides and legs, using a Jacto knapsack sprayer.

Fly population was monitored at day one, seven and seven day intervals onwards up to day 42 after treatment on 15 randomly selected and identified ear tagged cows in each group with operators in a truck driven among the cattle in each herd. The total number of horn flies observed at close range (with a 10 x 50 binoculars) on one side of each identified animal was recorded at approximately the same time (between 09:00 and 12:00 a.m.) when the weather conditions were suitable and most flies were active. To ensure consistency between readings the same observer scored all groups. At every assessment all groups were counted, alternating the starting group at each scoring.

A plot of the fly counts revealed a skewness of distribution. For this reason, a square root transformation of counts was used to stabilize the variation and provide a more representative estimate of the average number of flies per animal. The following formula was used[12].

$$\left(\frac{X_1^{1/2} + X_2^{1/2} + \ldots + X_n^{1/2}}{n} \right)^2$$

where, X_1 = number of flies on animal 1
n = total number of animals

* SHELL BRASIL S.A.

Means determined on day 0 and subsequently were tested for significant differences ($p \leq 0.05$) using a one-way analysis of variance (ANOVA) and multiple comparisons of means were done using the Student-Neuman-Keuls multiple range test[8].

RESULTS AND DISCUSSION

The pre- and post-treatment mean values of horn fly counts, the standard deviation of the mean (S.D.) and the percentage reduction data for all treatment groups are summarized in Tab. 1.

On days 0 and 42, statistically significant differences could not be detected among the eight experimental groups.

The seven experimental treatments reduced horn fly population to zero within 24h after application.

The post-treatment mean fly counts of the animals treated with alpha-cypermethrin alone (Groups G1, G2 and G3) did not differ significantly during the course of the experiment, all these different concentrations of alpha-cypermethrin providing 100% control for 28 days post-treatment. Although the horn fly counts of the animals treated with the pour-on formulations had begun to rise at about day 35 (range of 0 to 15 flies per animal), all treated groups still exhibited a percentage reduction of more than 90% on day 42 (between 96.4 and 94.0). Persistance of the marked reductions in fly counts during the relatively prolonged post-treatment period with alpha-cypermethrin is in accordance with our previous observations[10].

Complete horn fly control was achieved for 21 days with the combination of either cypermethrin or alpha-cypermethrin with chlorfenvinphos (Groups G4, G5 and G6). By day 28, although each treatment group had failed to eliminate flies completely, all treated groups showed a percentage reduction of more than 90% between day 28 and day 42 (range of 0 to 10 flies per animal). Our findings are in general agreement with the report of SCOTT; GRISI[11] (1991) in Brazil, which demonstrated that alphamethrin, a pyrethroid recently labeled for use on livestock, used concurrently with the organophosphate dichlorvos, produced substancial reductions in horn fly counts for at least 30 days. Unfortunately, in cases where mixtures have been applied, the results have been positive, negative, or inconclusive, apparently as a function of the care with which the components of the mixture were chosen[1].

As it was confirmed for Groups G1, G2, G3, G4, G5 and G6, the rapid knockdown of horn flies, 24h post-treatment, was observed after 40% chlorfenvinphos (Group G7) application.

TABLE 1

Geometric mean pre-and post-treatment horn fly counts and percentage reduction in groups of cows treated with alpha-cypermethrin, alpha-cypermethrin or cypermethrin-chlorfenvinphos mixtures and chlorfenvinphos alone. São José do Rio Preto - SP, 1991.

TREATMENT GROUP	Nº OF COWS	DAY 0	TIME POST-TREATMENT (DAYS) 1	7	14	21	28	35	42
G_1 2.0% alpha-cypermethrin (pour-on) 10 ml/animal	15	40.0 ± 1.6[a]* (25 - 95)**	1.0[a] (0) [100.0]***	1.0[a] (0) [100.0]	1.0[a] (0) [100.0]	1.0[a] (0) [100.0]	1.0[a] (0) [100.0]	1.2±1.6[a] (0 - 4) [96.9]	1.4±2.0[a] (0 - 6) [96.4]
G_2 1.5% alpha-cypermethrin (pour-on) 10 ml/animal	15	40.4 ± 1.4[a] (23 - 81)	1.0[a] (0) [100.0]	1.0[a] (0) [100.0]	1.0[a] (0) [100.0]	1.0[a] (0) [100.0]	1.0[a] (0) [100.0]	2.0±2.9[a] (0 - 15) [95.0]	2.4±2.0[a] (0 - 7) [94.0]
G_3 1.0% alpha-cypermethrin (pour-on) 10 ml/animal	15	55.9 ± 1.5[a] (33 - 125)	1.0[a] (0) [100.0]	1.0[a] (0) [100.0]	1.0[a] (0) [100.0]	1.0[a] (0) [100.0]	1.0[a] (0) [100.0]	1.2±1.4[a] (0 - 3) [97.8]	2.9±1.7[a] (0 - 6) [94.8]
G_4 2.5% cypermethrin 13.8% chlorfenvinphos (by hand spray) 1:1,000	15	52.9 ± 1.7[a] (30 - 127)	1.0[a] (0) [100.0]	1.0[a] (0) [100.0]	1.0[a] (0) [100.0]	1.0[a] (0) [100.0]	1.1±1.2[b] (0 - 1) [97.9]	1.2±1.7[a] (0 - 5) [97.6]	2.8±1.3[a] (1 - 5) [94.5]
G_5 2.5% cypermethrin 13.8% chlorfenvinphos (by hand spray) 1:400	15	74.8 ± 1.6[a] (35 - 160)	1.0[a] (0) [100.0]	1.0[a] (0) [100.0]	1.0[a] (0) [100.0]	1.0[a] (0) [100.0]	1.5±1.9[b] (0 - 7) [97.9]	1.4±1.6[a] (0 - 3) [98.0]	1.7±1.4[a] (0 - 6) [97.6]
G_6 3.0% alpha-cypermethrin 30% chlorfenvinphos (by hand spray) 1:1,000	15	38.2 ± 1.7[a] (23 - 80)	1.0[a] (0) [100.0]	1.0[a] (0) [100.0]	1.0[a] (0) [100.0]	1.0[a] (0) [100.0]	1.4±1.6[b] (0 - 3) [94.9]	1.8±2.2[a] (0 - 10) [93.5]	2.2±1.6[a] (1 - 6) [90.3]
G_7 40% clorfenvinphos (by hand spray) 1:800	15	40.2 ± 1.5[a] (18 - 70)	1.0[a] (0) [100.0]	2.3±2.8[b] (0 - 11) [94.0]	2.9±3.4[b] (0 - 10) [92.7]	2.4±2.5[b] (0 - 12) [93.8]	2.1±1.9[b] (0 - 8) [94.6]	1.8±1.6[a] (0 - 4) [95.3]	2.7±1.9[a] (2 - 10) [93.2]
G_8 Untreated control	15	53.7 ± 1.4[a] (22-84)	67.3±1.9[b] (34 - 97)	59.8 ± 1.7[c] (29 - 78)	64.1±1.8[c] (37 - 86)	56.4±1.7[c] (29 - 70)	51.1±1.9[c] (22 - 71)	15.1±2.7[b] (8 - 27)	3.1±2.0[a] (2 - 11)

* Geometric mean ± S.D. based on square root transformation. Different superscript letters within columns indicate that the mean values differ significantly at the $p \leq 0.05$ level.

** Horn fly counts (minimun-maximum)

*** Percentage reductions

By day 7, horn flies reappeared, but adequate control (more than 90%) was still obtained for 42 days (less than 12 flies per animal).

The horn fly challenge in the control group (G8) remained approximately the same up to day 28 post-treatment (range of 22 to 97 flies per animal). After this time a decrease in the population of flies was observed due, probably, climatic changes, associated with the occurrence of successive heavy rainfall.

On day 42 the trial was finished because the horn fly population in all treated groups and in the control group did not differ significantly and the herd had to be moved.

Data from the present trial and from previous studies in Brazil[10,11] indicate that horn flies, at present, apparently are susceptible to insecticides, since the fly is a recently introduced pest. Although, it seems prudent to initiate control strategies designed to retard the development of possible insecticide resistance, and thus extend the effectiveness of the available, and potentially available chemical control technologies.

In our study, all applied treatments administered once at the start of the trial provided marked reductions of at least 90% of horn fly population, that not returned to pre-treatment levels over the six week study.

RESUMO

A eficácia de formulações pour-on de alfa-cipermetrina e a de formulações para aplicação por pulverização, tanto de alfa-cipermetrina como de cipermetrina associada ao clorfenvinfos, assim como a de clorfenvinfos utilizada isoladamente, foi avaliada no controle da mosca-dos-chifres em gado de corte mantido em sistema de pastejo. A população de moscas foi monitorizada durante 42 dias após o tratamento. O estudo indicou que todos os tratamentos utilizados proporcionaram pelo menos 90% da redução da população de mosca-dos-chifres durante as seis semanas de condução do experimento e que, no momento, deve ser considerada a conveniência da utilização dessas formulações para o controle da ***Haematobia irritans*** no Brasil.

UNITERMOS: ***Haematobia irritans***; Inseticidas; Bovinos

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